Unit-6 Enzymes

(MCQs)

Introduction

1- **Who first used the term Enzyme?**
(A) Zacharias Johnson
(B) Robert Brown
(C) Winholm Kuhne
(D) Louis pasture

2- **Metabolism is derived from Greek word meaning:**
(A) Division **(B)** Change
(C) Deduction (D) Matter

3- **Which scientist gave the concept of Metabolism first?**
(A) Ibn-e-Nafees (B) Jabir
(C) Newton (D) William

4- **In metabolism works as catalyst.**
(A) Enzyme (B) Vitamins
(C) Protein (D) Lipids

5- **All biochemical reactions occurring in living organisms necessary for life are called as:**
(A) Metabolishm
(B) Anabolism
(C) Catabolism
(D) Mutualism

6- **The molecule at which enzyme act is called:**
(A) Active site
(B) Cofactor
(C) Prosthetic group
(D) Substrate

7- **Biochemical reactions in which larger compounds are synthesized called:**
(A) Metabolism
(B) Anabolism
(C) Catabolism
(D) Decomposition

6.1 Characteristics of Enzymes

8- **The kind of protein which catalyze a biochemical reaction called:**
(A) Enzymes
(B) Harmones
(C) Co-enzymes
(D) None of these

9- **To which group of molecules enzymes belongs?**
(A) Carbohydrates

(B) Proteins
(C) Lipids
(D) Nucleic Acid

10- Almost all enzyme are:
(A) Carbohydrates
(B) Proteins
(C) Fats
(D) None of these

11- What is true about Enzymes:
(A) They make biochemical reactions to proceed spontaneously.
(B) They lower the activation energy of a reaction.
(C) They are not very specific in their choice of substrate.
(D) They are needed in large quantities.

12- If organic cofactors are loosely attached with enzyme they are called:
(A) Prosthetic group
(B) Co-enzyme
(C) Active site
(D) Activators

13- Which of the following vitamins work as co-enzyme?
(A) Vitamin A (B) Vitamin D
(C) Vitamin C (D) Riboflavin

14- Enzyme used for the removal of protein stains from clothes is:
OR Biological Detergent is:
OR An example of biological detergent is:
(A) protease (B) lipase
(C) amylase (D) pepsin

15- Enzyme used for cleaning utensils is _______:
(A) Amylase (B) Trypsin
(C) Lipase (D) Tylon

16- The catalytic region on enzyme is called:
(A) Metabolic Site
(B) Co-enzyme
(C) Cofactor
(D) Active Site

17- The term metabolism is derived from which language.
(A) Latin (B) Greek
(C) German (D) Arabic

18- Which is true about co-factors?
(A) Break Hydrogen bonds in proteins
(B) Help Facilitate Enzyme Activity
(C) Increase Activation Energy
(D) Are composed of protein

19- The molecules at which enzymes act are called:
(A) Co-factor (B) Inhibitor
(C) Co-enzyme (D) Substrate

20- Which vitamin acts as co-enzyme?
OR One important Co-enzyme is:
(A) Formic acid (B) Nuclei acid
(C) Amino acid (D) Folic acid

21- When organic co-factors are tightly bound to enzyme:
(A) Coenyzme
(B) Apoenzyme
(C) Cofactor
(D) Prosphetic group

22- Prosthetic group are:
(A) Required by all enzymes
(B) Loosely attached with enzymes
(C) Proteins in nature
(D) Tightly bound to enzymes

23. Structurally enzymes are made of:
(A) Amino Acids
(B) Minerals
(C) Vitamins (D) Fats

6.1.1 Factors affecting the Rate of Enzyme Action

24- Enzyme pepsin works in ________:
(A) Mouth (B) Intestine
(C) Desophagus (D) Stomach

25- .... Enzyme work in stomach:
(A) Lipase (B) Trypsin
(C) Pepsin (D) Amylase

26- Trypsin enzyme work in:
(A) Stomach
(B) Large Intestine
(C) Small Intestine
(D) Heart

27- Trypsin enzyme shows its activity at:
(A) Medium P^H (B) High P^H
(C) Low P^H (D) Acidic P^H

28- In which medium enzyme trypsin works?
(A) Alkaline (B) Acidic
(C) Neutral (D) Slight basic

29- The optimum temperature for the

maximum working speed of Human Enzymes is:

(A) $27^{o}C$ (B) $35^{o}C$
(C) $0^{o}C$ **(D)** $37^{o}C$

30- **In stomach, pepsinogen is converted into:**

(A) Pepsin (B) Bicarbonate
(C) HCL (D) Gastrin

6.2 Mechanism of Enzyme Action

31- **When was induced fit model presented?**

(A) 1858 (B) 1956
(C) 1963 (D) 1958

32- **Lock and Key model was prepared in:**

(A) 1824 (B) 1924
(C) 1994 **(D)** 1894

33- **In 1894 "Lock and Key Model proposed by":**

(A) Aristotle
(B) Robert Hooke
(C) Emil Fisher
(D) Louis pasture

34- **Who proposed the induced fit model of enzyme action:**

(A) Emil Fischer
(B) Daniel Koshiand
(C) Ibn-e-Nafees
(D) Jabir Bin Hayyan

6.3 Specificity of Enzymes

35- **Protein is digested by:**

(A) Lipase (B) Amylase
(C) Protease (D) Nuclease

36- **Starch is broken down by an enzyme called:**

OR **Enzyme involved in break down of strach is :**

(A) Amylase (B) Lipase
(C) Tripsin (D) Pepsin

37- **Amylase enzyme act on:**

OR **The Enzyme which acts only on Lipids is:**

(A) Carbohydrates
(B) Proteins
(C) Lipids (D) Starch

OR **(A)** Lipase (B) Amylase
(C) Pepsin (D) Protease

38- **Enzyme Lipase act on lipids and convert them into:**

(A) Acetic acid (B) Lactic acid
(C) Fatty acid and glycerols
(D) Ascorbic acid

39- **Specificity of enzymes depend upon:**

(A) Temperature
(B) Concentration of substrates
(C) Shape of active sites
(D) pH

(Short Questions)

Introduction

1. **Define Substrate and Product.**

OR **What is meant by Substrates?**

Ans. **Substrates:** The moleculs at which enzymes act are called substrate.
Example: Pepsin enzyme acts on proteins, so proteins are substrates.
Product: Enzymes converts the substrate into different molecules which are called products.

2. **What is difference between Anabolism and Catabolism?**

Ans. **Anabolism:**
Anabolism include all those biochemical reaction in which larger molecules are formed from smaller molecules.
Catabolism:
Catabolism include all those biochemical reactions in which smaller molecules are formed from larger molecules.

3. **Define Activation Energy. How enzymes effect on it?**

OR **Explain Activation Energy?**

OR **Why activation energy is necessary?**

Ans. It is defined as minimum amount of energy required to start a reaction.
Enzymes lower the activation energy in several ways. They may alter the shape of substrate and reduce the requirement of energy for this change. Some enzymes do so by disrupting the charge distribution on substrates. Enzymes may also lower activation energy by bringing substrates in the correct orientation to react.

6.1 Characteristics of Enzymes

4. Who first used the term enzyme?

Ans. In 1878, German Physiologist Winhelm Kuhne first used the term enzyme.

5. What is meant by Biocatalyst?

OR What is meant by Enzyme? Also describe their any one function.

OR Define Enzyme.

Ans. Enzymes are proteins that catalyze biochemical reaction during reaction and speed up reaction. Enzymes are also called biocatalysts.

6. Write names of four enzymes.

Ans. i- Amylase ii. Lipase
iii. Protease iv. Maltase

7. Describe any two properties of enzyme.

Ans.

(i) Almost all enzymes are proteins i.e. they are made up of amino acids.

(ii) Most enzyme reaction rates are millions of times faster than those of comparable uncatalyzed reactions. As with all catalysts, enzymes are not consumed by the reactions they catalyze.

8. Are all Biocatalysts protein in nature? Explain.

Ans. All biochemical catalysts are not proteins, for example some RNA molecules also catalyze reactions.

9. Write down to benefits of Biocatalysts.

Ans. Benefits of Biocatalysts:

i. Biocatalysts are proteins which speed up (catalyze) biochemical reactions.

ii. Biocatalysts are proteins which do not damage itself during chemical reactions.

10. Give example of intracellular and Extracellular Enzyme.

OR Differentiate between Extra cellular and Intracellular enzymes:

Ans. Enzyme can be categorized on the basis of the site where they work.

Intracellular enzymes: These are enzymes of glycolysis working in the cytoplasm.

Example: Enzymes of glycolysis works in the cytoplasm.

Extracellular enzymes: These are pepsin enzyme working in the stomach cavity.

Example: Pepsin enzyme working in the stomach cavity.

11. Who give the concept of Metabolism? Also define Metabolism.

OR Define metabolism. Name its two types.

OR What is meant by Metabolism? Explain.

OR Define Metabolism. What is its function.

OR Define metabolism and describe its importance.

Ans. The term of metabolism is derived from a Greek word meaning "change". The concept of metabolism was first given by Ibn-e-Nafees, who stated that "the body and its parts are always undergoing change. The sum of all bio chemical reactions that occurs in living organisms to carry out life activities are called metabolism.

Metabolism is of two types:

(i) Anabolism (ii) Catabolism.

12. Define Anabolism with example.

Ans. Anabolism: Anabolism is a constructive process. Smaller, simples molecules combine together in anabolism to form larger, complexer molecules. Energy is absorbed in Anabolism.

Example: Photosynthesis is an anabolic process.

13. What is metabolic pathways?

OR Write down the functions of Active site (functions of sides.

Ans. Several enzymes can work together in a specific order, creating metabolic pathways. In a metabolic pathway, one enzyme takes the product of another enzyme as a substrate. After the reaction, the production is passed on to the next enzyme.

14. Define Prosthetic group and Co-enzyme.

OR Define Prosthetic Group.

OR What is meant by co-enzyme.

OR Define co-enzyme.

OR What is the difference between prosthetic group and co-enzyme?

Ans. Prosthetic Group: If organic

cofactors are tightly bound to enzyme, they are called prosthetic groups.

Coenzymes: If organic cofactors are loosely attached with enzyme, they are called coenzymes.

15. Write names of two coenzymes.
OR Write names of important vitamins those acts as Co-enzymes.
OR Define Co-enzyme. Give its two examples also.

Ans. Co-enzyme: If organic cofactors are loosely attached with enzyme, they are called coenzymes.

(i) Riboflavin (ii) Thiamine
(iii) Folic acid.

16. Define Cofactors. Also give example.
OR What are cofactors?

Ans. Some enzymes require non-protein molecules or ions called cofactors.

Example: (i) Flivin (ii) Heam.

17. Define Cofactor and Co-enzyme.
OR Give difference between Cofactor and Co-enzyme.

Ans. Cofactor:
Some enzymes do not need any addtional component to work. However, others require non-protein molecules or ions called cofactors.

Co-enzyme:
If organic cofactors are loosely attached with enzyme, they are called coenzymes.

18. What is role of enzyme in paper industry?
OR What is use of engyme in paper industry?

Ans. Enzyme break starch to lower its viscosity that aids in making paper.

19. What are the uses of enzymes.
OR Write the use of enzymes in food and beverage industry.
OR Describe the use of enzymes in food industry.
OR Write two uses of enzymes in industries.

Ans. Food industry: Enzymes that break starch into simple sugars are used in the production of white bread, buns etc.

Brewing industry: Enzymes break starch and proteins. The products are used by yeast for fermentation (to produce alcohol).

20. What is use of enzymes in biological detergents?
OR Give two uses of Biological Detergnets.

Ans.
(i) Protease enzymes are used for the removal of protein stains from clothes.
(ii) Amylase enzymes are used in dish washing to remove resistant starch residues.

21. Name those Industries where enzymes are used.

Ans. Food industry, Brewing industry and Paper industry.

22. What is difference between substrate and active site.

Ans: Substrate: The molecule at which enzymes act are called substrate. Enzymes converts the substrate into different molecules wich are called products.

Example: Pepsin enzyme acts on protein so protein is substrate.

Active site: During catalysis, only a small portion of enzyme molecule is directly involve in the chemical reaction and this catalytic region is known as active site

6.1.1	Factors affecting the Rate of Enzyme Action

23. What factors affect the rate of enzyme reaction? Write name.

Ans. Following factors can affect the rate of enzyme activity.
(i) Temperature
(ii) Substrate concentration (iii) (pH)

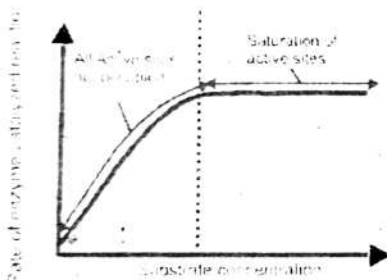
24. What is meant by Active site? write its benifits.
OR Write two benifits of active site.
OR Write down two benefits of active sites.
OR What is meant by active site in enzyme?

Ans. Active Site: During catalysis, only a small portion of enzyme molecule is directly involve in the chemical reaction and this catalytic region is known as active sites.

Benifits:

(i) Active sites recognize the substrate.
(ii) It binds with substrate and carries out reaction.

25. What is meant by saturation of active sites?
OR What is meant by saturated active site?
OR What is substrate concentration?

Ans. If enzyme molecules are available in a reaction, increase in substrate concentration increases the rate of reaction. If enzymes concentration is kept constant and amount of substrate is increased, a point is reached where any further increase in substrate does not increase the rate of reaction any more. When the active sites of all enzymes are occupied, any more substrate molecules do not find free active sites. This state is called saturation of active sites and reaction rate does not increase.

26. Define Optimum temperature. What is Optimum temperature of human enzyme?
OR What is meant by Optimum temperature?

Ans. Enzymes works at its maximum rate at a specific temperature called optimum temperature. The optimum temperature of Human enzymes is 37^{o}C.

27. What is optimum temperature for the working of an enzyme? Give an example.
OR What is Denaturation of enzyme.
OR What is meant by denaturing of enzymes?
OR What is the effect of temperature on enzymes?
OR Why enzymes become denaturate at very high temperature?
OR How enzyme becomes denaturate?

Ans. Maximum working speed of human enzyme is at 37^{o}C. When temperature is raised well above the optimum temperature, heat energy increases the vibrations of enzyme and the globular structure of enzyme is lost. It slows the activity of enzyme and it may be blocked completely. Due to denaturation of enzyme.

28. Which is called optimum pH?

Ans. Every enzyme works at its maximum rate at a specific pH called as the optimum pH for that enzyme e.g pepsin work maximum at pH of 2.

29. How pH effects on enzymes action? Give an example.

Ans. All enzymes work at their maximum rate at a narrow range of pH, called as the optimum pH. A slight change in this pH causes retardation in enzyme activity or blocks it completely. Every enzymes has its specific optimum pH value. For example pepsin (working in stomach) is active in acidic medium (low pH) while trypsin (working in small intestine) shows its activity in alkaline medium (high pH). Change in pH can effect the ionization of the amino acids at the active site.

30. In which medium pepsin and trypsin enzymes work?

Ans.
(i) Pepsin enzyme works in Acidic medium.
(ii) Trypsin enzyme works in alkaline medium.

31. Differentiate between Protease enzyme and Amylase enzyme.

Ans. Protease Enzyme:
(i) Protease enzyme is specified for protein substrate.
(ii) Protease enzyme is used in cloth washing detergents to remove protein stains from clothes.

Amylase Enzyme :
(i) Amylease enzyme is specified for starch substrate.
(ii) Amylase enzyme is used in dish washing detergent to remove resistant residue of starch.

6.2 Mechanism of Enzyme Action

32. Write and explain the equation for the mechanism of enzyme action.

Ans. Enzyme action: When enzyme attaches with substrate, a temporary enzyme-substrate (ES) complex is

formed. Enzyme catalyzes the reaction and substrate is transformed into products. After it, the ES complex breaks and enzyme and products are released.

Equation:

$$E + S \rightarrow ES\ complex \rightarrow E + P$$

33. Who put forward the Lock and Key Model? Write definition.

OR Define about Lock and Key model of enzyme action.

OR Describe vriefly "Lock and Key" model of enzymes.

Ans. Lock and Key Model:

(i) In order to explain the mechanism of enzyme action a German chemist Emil Fischer, in 1894, proposed lock and key model.

(ii) According to this model, both enzyme and substrate posses specific shapes that fit exactly into one another.

(iii) This model explain enzyme specificity.

34. Define induced fit model. Who suggested this model?

OR Explain about induced fit model.

OR Define induced fit model of enzymes.

Ans. Induced fit model:

(i) In 1958, an American biologist Daniel Koshland suggested a modification to lock and key model and proposed induced-fit model.

(ii) Induced fit model is more acceptable than "lock and key" model of enzyme action.

(iii) According to this model, active site is not a rigid structure rather it is molded into the required shape to perform its function.

(iv) In this model daniel Koshland suggested that Enzymes are flexible particles and when their active sites bind with substrate they change their shapes.

6.3 Specificity of Enzymes

35. Write down the names of Enzymes that act on protein and starch.

Ans. Starch break, by amylase.Protein break by enzyme protease.

36. What is the function of Amylase and Lipase?

Ans. Amylase enzymes breaks starch Lipase breaks only Lipids.

37. Write note on specification of Enzymes.

OR What is meant by specification of enzyme?

Ans. Enzymes are also substrate specific. The enzyme protease is used to breaks peptide bonds in proteins and will not work on starch. Strach is broken down by an enzyme amylase. Lipase enzyme acts only on lipids and digests them into fatty acids and glycerol.

Long Question (Unsloved)

6.1

1. Write characteristics of enzyme.

OR Write three/four properties of Biocatalysts.

OR What are enzymes? Describe 5 characteristics of enzyme.

2. Write a note on uses of enzymes.

OR Write a comprehensive note on uses of enzymes.

OR What is enzyme? Write the use of enzyme in different industries.

3. Define metabolism, anabolism and catabolism.

6.1.1

4. Which factors effect the rate of enzyme action?

OR Describe the effect of temperature and pH on rate of enzyme action.

OR What are the effects of substrate concentration and PH on the rate of enzyme action?

OR Describe any two factors affecting the rate of enzyme action.

OR Describe the affect of temperature and substrate concentration on enzyme action.

OR Define Enzyme. Write the temperature as a factor affecting the rate of Enzyme Action.

6.2

5. Explain Induced fit model.

OR Describe two models for enzyme action mechanism.

OR Describe the Lock and Key Model of Enzyme Action.

OR Explain the mechanism of enzyme action.

OR What is enzyme? Explain the mechanism of enzyme action.

6.3

6. Write note on specificity of enzyme.

OR What is meant by specification of enzyme? Explain it.

Unit-7 Bioenergetics

(MCQs)

7.1 Role of Bioenergetics and ATP

1- ATP was discovered by:
(A) Fritz Lipmann
(B) Calvin
(C) Karl Lohman
(D) None of these

2- ATP was discovered in:
(A) 1957 (B) 1945
(C) 1929 (D) 1935

3- One molecule of ATP release energy:
(A) 7.3Kcal (B) 7.4Kcal
(C) 7.6Kcal (D) 7.5Kcal

4- The energy currency of all the cells is called:
(A) ADP (B) AMP
(C) ATP (D) AFD

5- From which bond of ATP molecules energy is taken?
(A) P-P bond (B) C-H bond
(C) C-O bond (D) C-N bond

6- Each ATP molecule has the number of sub units:
(A) 2 (B) 1 **(C) 3** (D) 4

7- Number of phosphate gorups in ATP molecule:
(A) 1 (B) 2 **(C) 3** (D) 4

8- The covalent bond connecting two phosphates is indicated by:
(A) Ratio (B) Proportion
(C) Colon **(D) Tilde**

9- ATP is an example of:
(A) Amino Acid
(B) Nucleotide
(C) Fatty Acid
(D) Nucleic Acid

10- The loss of electron from atom is called:
(A) Reduction **(B) Oxidation**
(C) Anabolism (D) Catabolism

11- Energy stored in the chemical bond is:
OR Energy is found in bonds of food.
(A) Potential Energy
(B) Kinetic Energy
(C) Elastic energy
(D) Both A and B

12- Karl Lohmann was awarded noble prize in:
(A) 1940 **(B) 1941**
(C) 1958 (D) 1986

7.2 Photosynthesis

13- By product produced during photosynthesis is:
OR By product of photosynthesis is:
(A) Carbondioxide
(B) Nitrogen
(C) Oxygen
(D) None of these

14- In which process oxygen is released as a by-product?
(A) photosynthesis
(B) respiration
(C) fermentation
(D) reproduction

15- Raw material for photosynthesis is:
(A) H_2O O_2 (B) CO_2 O_2
(C) $C_6H_{12}O_6$ (D) H_2O, CO_2

16- Calvin got Nobel prize in:
(A) 1961 (B) 1971
(C) 1985 (D) 1991

17- Main photosynthetic pigment is:
(A) Chlorophyll 'b'
(B) Chlorophyll 'a'
(C) Carotenoids
(D) Xanthophylls

7.2.1 Mechanism of Photosynthesis

18- Who discovered details of dark reactions?
OR Dark reaction is studied by:
(A) Schwann
(B) Schleiden
(C) Malvin Calvin
(D) Robert Brown

19- From which gas glucose form by reduction in the dark reaction of glucose:
(A) Carbon monoxide
(B) Hydrogen
(C) Carbon dioxide
(D) Oxygen

20- Dark reactions are part of:
(A) Respiration (B) Necrosis
(C) Metastasis **(D) Photosynthesis**

21- In which part of chloroplast dark reactions of photosynthesis take

place?
OR- The place where dark reactions are carried out is:
OR- Dark reactions take place in:
(A) Thylakoid (B) Matrix
(C) Cristae **(D) Stroma**

22- Light reactions take place in:
(A) Stroma **(B) Thylakoids**
(C) Cytosol (D) Mitochondria

23- The whole series of light reactions is called:
(A) S-scheme **(B) Z-scheme**
(C) L-scheme (D) None of these

24- Which type of reaction take place on the membrane of thylakoid of chloroplast?
(A) Dark reaction
(B) Light reaction
(C) Electron Transport chain
(D) Glycolysis

25- Compounds produced during light reactions are:
(A) FADH (B) NADPH ATP
(C) $C_6H_{12}O_6$ (D) $C_{12}H_{22}O_{11}$

26- When chlorophyll molecule absorb light their energy level increases and are emitted:
(A) Proton (B) Neutron
(C) Electron (D) None

27- Another name for the dark reaction of Photosynthesis is:
(A) Calvin cycle (B) Carbon cycle
(C) Nitrogen cycle (D) Water cycle

7.2.2 Role of Chlorophyll and Light

28- Chloroplast is used in.......... process:
(A) Lipid formation
(B) Protein formation
(C) Photosynthesis
(D) None of these

29- Which component of the leaf cells, chlorophyll is present?
(A) Stroma
(B) Thylakoid
(C) Plasma membrane
(D) Cytoplasm

30- How much light is absorbed falling on leaf surface during photosynthesis:
(A) 1% (B) 2% (C) 3% (D) 4%

31- Stomata cover only .... of the leaf surface:
(A) 1-2% (B) 2-3%
(C) 3-4% (D) 4-5%

32- Chlorophyll pigment absorbs maximum light in the wave length of:
OR Chlorophyll absorb ________ colours of light.
OR Chlorophyll pigment absorbs maximum light in the wave length of:
(A) Green and Red
(B) Green and Blue
(C) Red and Blue
(D) Only Green

7.3 Respiration

33- The compound that absorbs carbon dioxide is:
(A) NaOH **(B) KOH**
(C) $Ca(OH)_2$ (D) $Mg(OH)_2$

34- The greatest fuel of energy for cellular respiration:
(A) Glucose (B) Protein
(C) Amino acid (D) Lipids

35- Through which process organisms get energy:
(A) Photosynthesis
(B) Respiration
(C) Transpiration
(D) Evaporation

36- The example of three Carbon Molecule is:
(A) Glucose **(B) Pyruvic acid**
(C) Starch (D) Ribose

37- In glycolysis, glucose(6C) molecule is broken into two molecule of:
(A) NADH
(B) $FADH_2$
(C) Pyruvic acid(3C)
(D) Acetyl-CoA (C)

38- How many ATP molecules are produced by a NADH in electron transport chain?
(A) 1 (B) 2 **(C) 3** (D 4

39- During anaerobic oxidation of glucose molecule:
(A) 2 (B) 4 (C) 6 (D) 8

7.3.1 Aerobic and Anaerobic Respiration

40- Necessary for aerobic respiration is:

(A) Carbon dioxide **(B)** Oxygen
(C) Water (D) Hydrogen

41- In which process of aerobic respiration oxygen takes part?
(A) Glycolysis
(B) Krebs cycle
(C) Mid phase of glycolysis and krebs cycle
(D) Electron Transport Chain

42- By whose fermentation cheese and yogurt produce?
(A) Bacteria (B) Virus
(C) Fungi (D) Algae

43- Alcohol is prepared by:
(A) Yeast (B) Algae
(C) Onion (D) Pepper

44- The sites of Aerobic Respiration are :
(A) Mitochondria (B) Plastids
(C) Lysosomes (D) Centrioles

7.3.2 Mechanism of Respiration

45- Which of these can enter into Krebs cycle?
(A) Pyruvic acid
(B) Glucose
(C) Citric acid
(D) Acetyle co-enzyme

46- Process of glycolysis is found in ....
OR Process of glycolysis occurs is:
(A) Ribosomes
(B) Cytoplasm
(C) Golgi complex
(D) Vacuole

7.3.3 The Energy Budget of Respiration

47- How much ATP molecules are formed during cellular respiration?
(A) 40 (B) 38 (C) 63 **(D)** 36

(Short Questions)

7.1 Role of Bioenergetics and ATP

1. Who discovered the ATP molecule? What is its function in cell?
OR Who discovered ATP and when he awarded Noble Prize?
OR When and who discovered ATP?
OR What is meant by Cell Energy Currency?
OR Define ATP and write its uses.
OR Why ATP considered as energy currency of cell.
OR Write two function of ATP cell.

Ans. **Discovery of ATP:** ATP was discovered in 1929 by Karl Lohmann, and was proposed to be the main energy-transfer molecule in the cell by the Nobel Prize winner, Fritz Lipmann in 1941.

Function of ATP: ATP is the main energy source for majority of the cellular functions like the synthesis of macromolecules (DNA, RNA, and Protein), movement, transmission of nerve impulses, active transport, exocytosis and endocytosis etc.

2. What is Abbreviation of ATP?

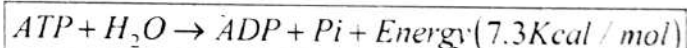
Ans. ATP is the abbreviation of Adenosine Triphosphate. It is major energy currency of cells.

3. When and what is discovered by "Karl Lohmann"?

Ans. ATP was discovered in 1829 by "Karl Lohmann", and was proposed to be the main energy-transfer molecule in cell by the nobel prize winner, Fritz Lipmann in 1941.

4. How much energy is evolved from one Mole of ATP?

Ans. 7.3 Kilocalories or 7300 Calories energy is evolved from one mole of ATP

$$ATP + H_2O \rightarrow ADP + Pi + Energy(7.3Kcal/mol)$$

5. Write down the three subunits of ATP.
OR Sketch molecular stucture of adenosine triphosphate.
OR Write down the three subunits of ATP.

Ans. **Each ATP molecule has three subunits:**
(i) Adenine-a double-ringed nitrogenous base
(ii) A ribose-a five carbon sugar
(iii) Three phosphate groups in a linear chain.

6. Explain Bioenergetics. With the help of an example.

OR What is meant by bioenergetics?

OR Define bioenergetics.

Ans. Bioenergetics is the study of energy relationship and energy transformations in living organisms. Organisms obtain energy by metabolizing the food they eat or prepare. Food contains potential energy in its bonds. When these bonds are broken down, a large amount of kinetic energy is usually released. Some of this energy is stored in the form of potential energy in the bonds of ATP molecules while the rest escapes as heat. The potential energy stored to carry out life activities.

7. Write the role of Bioenergetics and ATP.

OR Write the role of ATP for the cell.

Ans. Bioenergetics means energy conversions in the body of living organisms. Organisms obtain energy by metabolizing the food, they eat or prepare. Food contains potential energy in its bonds. When these bonds are broken down, a large amount of kinetic energy is stored in the form of potential energy in the bonds of ATP molecules while the rest escapes as heat. The potential energy stored in ATP is transformed into kinetic energy to carry out life activities.

8. Define oxidation and reduction.

OR Differentiate between Oxidation and Reduction.

Ans. Oxidation: The loss of electrons is called oxidation.

Reduction: The gain of electrons is called reduction.

9. What is redox reaction?

Ans. Chemical reactions in which exchange of electrons takes place is called redox reaction. It is a combination of two reactions i.e, Oxidation reaction and reduction reactions, Chemical reactions in living organisms are almost redox reactions.

10. Explain that electrons can be source of energy during oxidation reduction reactions.

Ans. Electrons as a Source of energy release: Electrons can be an energy source. It depends upon their location and arrangement in atoms.

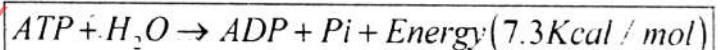
Example: when they are present in oxygen, they make stable association with oxygen atom and are not good energy source. But if electrons are dragged away from oxygen and attached to some other atom e.g. carbon or hydrogen, they make unstable association. They try to move back to oxygen and when this happens, energy is released.

11. Why oxidation - reduction reactions is called Redor - Reaction.

Ans.

(i) Exchange of electrons between atoms takes place during Redox Reactions.

(ii) Loss or removal of electron from an atom is called Oxidation where as gain or addition of electron to an atom is called Reduction.

$$ATP + H_2O \rightarrow ADP + Pi + Energy(7.3Kcal/mol)$$

12. Define two types of energy in living organisms.

Ans: In living organisms, energy exists in two forms:

(i) Kinetic energy (ii) Potential energy

Kinetic energy is actively involved in doing work, and Potential energy is stored for future use. Potential energy is stored in chemical bonds and is released as kinetic energy when these bond break.

7.2 Photosynthesis

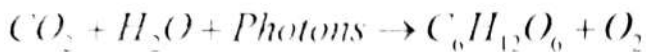
13. What is photosynthesis? Write its equation.

OR Draw a simpel equation for photosenthesis.

OR Define photosynthesis, also write its balanced equation.

Ans. Photosynthesis:

Photosynthesis is the manufacturing of glucose from carbon dioxide and water in the presence of sunlight and chlorophyll, with oxygen as a by product.

$$CO_2 + H_2O + Photons \rightarrow C_6H_{12}O_6 + O_2$$

14. What is meant by photosystem?

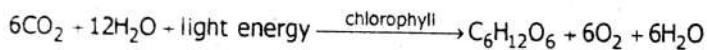
Ans. Photosynthetic pigments lie on thylakoid membranes of chloroplasts in cluster form called photosystem.

15. Write two important conditions for photosynthesis.

Ans. Some important conditions on photosynthesis are given below.

i) Accurate amount of water
ii) Chlorphyll and suitable intensity of light
iii) CO_2 is also necessory for this process as,

Plants made their food (glucose) by the reduction of it.

$$6CO_2 + 12H_2O + \text{light energy} \xrightarrow{\text{chlorophyll}} C_6H_{12}O_6 + 6O_2 + 6H_2O$$

16. Which products are produced during photosynthesis.

Ans. Glucose, oxygen and water molecules are produced during photosynthesis.

17. Why it is said that all life depend on photosynthesis?

Ans. Photosynthesis is the manufacturing of glucose with oxygen as a by-product from carbon dioxide and water in the presence of sunlight and chlorophyll.

$$6CO_2 + 12H_2O + \text{photons} \longrightarrow C_6H_{12}O_6 + 6O_2 + 6H_2O$$

That's why all life depends on photosynthesis.

18. Why and when Calvin was awarded nobel prize?

Ans: In 1961 melvin calvin was awarded by nobel prize for his work on details of dark reaction which is also known as calvin cycle.

7.2.1 Mechanism of Photosynthesis

19. What is abrivation of FAD?

Ans. Flavin adenine dinucleotide (FAD) is also a coenzyme like NAD^+. It gets 2 hydrogen and reduces into $FADH_2$.

20. What is the difference between light and dark reaction?

Ans. Light Reaction:

Light energy is captured and used to make high-energy molecules These reactions, are known as light reactions which take place on the thylakoid membranes of chloroplasts.

Dark Reaction:

Carbon dioxide is reduced to make glucose during dark reactions. The energy in the form of ATP is utilized in this process and is then stored in the bonds of glucose. Since these directions do not use light directly, they are known as dark reactions. The dark reactions take place in the stroma of the chloroplasts.Dark reaction is also know as kalvin cycle.

21. Define Light Reaction.

OR What are light reactions?

OR Define light reaction, why it is called Z. Scheme?

Ans. Photosynthesis occurs in two phases. During first phase, light energy is captured and is used to make high-energy molecules (ATP and NADPH). These reactions, take place on the thylakoid membranes of chloroplasts and known as light reactions. Due to its shape it is called as Z-scheme.

22. Define Dark Reactions.

Ans. Dark Reactions:

i) Dark Reaction is the second step of photosynthesis in which glucose is synthesized by the reduction of carbon dioxide.
ii) In this process, energy from high energy molecules (ATP and NADPH) is used.
iii) As direct sunlight is used in these reactions that's why these are called Dark Reactions.
iv) Dark Reaction takes place in stroma of chloroplast.

23. What is photolysis of water?

OR What is photolysis?

Ans. Light energy splits one molucule of

water As a result oxygen is released It is known as photolysis of water. Hydrogen produced during this process gives electrons to chlorophyll and becomes ion itself.

24. What is meant by Z-Scheme?

Ans. Z-Scheme: All stages of light reaction due to its Z-shaped chart is called Z-Scheme.

25. What are FAD and NAD?

Ans: FAD: Flavin adenine dinucleotide (FAD) is also a coenzyme like NAD^+. It gets 2 hydrogen and reduces into $FADH_2$.

NAND: Nicotinamide adenine dinuclcotide (NAD) is a co-enyzme. It is an oxidizing agent it accepts electron and reduced to form (NADH).

7.2.2 Role of Chlorophyll and Light

26. What is the Role of Light in photosynthesis?

Ans. Role of Light in Photosynthesis: Light energy excites the electrons of chlorophyll which after forms ATP and are used in reduction of carbon dioxide. In this way light energy is stored in the chemical bonds of glucose as chemical energy.

27. What is role of chlorophyll in photosynthesis.

Ans. Sunlight is absorbed by chlorophyll. It is then converted into the chemical energy which drives the process of photosynthesis.

28. What are Pigments?

OR Write the name of pigments used in photosynthesis.

Ans. Pigments are the substances that absorb visible light. Different pigments absorb light of different wavelengths. Important photosynthetic pigments are following:

1. chlorophyll a, 2. chlorophyll b
3. carotenoids.

29. What are Accessory Pigments? Give examples.

Ans. Chlorophyll-a is the main photosynthetic pigment. Others are called accessory pigments and include chlorophyll-b and carotenoids.

7.2.3 Limiting Factors in Photosynthesis

30. What is Limiting Factor?

Ans. Any environmental factor the absence or deficiency of which can decrease the rate of a metabolic reaction, is called limiting factor for that reaction. Many factors like light intensity, temperature, concentration of carbon dioxide and availability of water act as limiting factors for photosynthesis. All life depends on photosynthesis.

31. Write names of four limiting factors for photosynthesis.

Ans. Limiting Factors in Photosynthesis:

(i) Intensity of Light
(ii) Temperature
(iii) Carbon Dioxide
(iv) Availability of Water

32. Describe the effect of light intensity on photosynthesis.

OR Write the effects of light intensity and temperature on photosynthesis.

OR What are limiting factors in photosynthesis? Give two examples.

Ans. The factors that effects on photosynthesis called limiting factors for photosynthesis.

Effect of light: The rate of photosynthesis varies with light intensity. It decreases as light intensity decreases and increases as intensity increases. However at much higher light intensity, the rate of photosynthesis becomes constant.

Effect of Temperature: The rate of photosynthesis decreases with decrease in temperature. It increases as temperature is increased over a limited range. But if light intensity is low, increasing the temperature has little influence on the rate of photosynthesis.

33. What is the effect of CO_2 concentration on photosynthesis?

OR How CO_2 concentration effects the rate of photosynthesis?
OR Write the effect of Carbondioxide concentration on Phtosynthesis.
Ans. As carbon dioxide concentration rises, the rate of photosynthesis goes on increasing until limited by other factors. Increase in carbon dioxide concentratoin beyond a certain level causes the closure of stomata and it decreases the rate of photosynthesis.

7.3	Respiration

34. Define Respiration and cellular Respiration.
Ans. Respiration: Exchange of gases between organism and environment is called respiration.
Cellular Respiration: Cellular respiration is the break down of glucose in the cells of living organisms to produce energy.

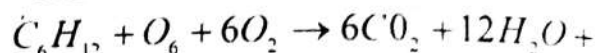
35. Name the compounds produced during respiration.
Ans. Carbon, dioxide, water and energy is obtained during respiration.

36. Define Cellular Respiration.
Ans. Organisms utilize oxygen for the breakdown of C-H bonds present in the food in their cells. This breakdown yields energy which is transformed into ATP. During this process the C-H bonds are broken by oxidation-reduction reaction and so carbon dioxide and water are also produced. The cellular energy-yielding process is called cellular respiration.

37. Why it is incorrect to say that energy relationship step of respiration is electron transport chain? (SWL-G1)-19
Ans: Energy is released in glycolysis and krebs cvcle in the form of NADH and $FADH_2$. Electron transport chain transforms the energy present in these compounds to ATP. So it is incorrect to say that energy relationship step of respiration is electron transport chain.

7.3.1	Aerobic and Anaerobic Respiration

38. Define Aerobic Respiration and write its equation.
OR Define Anaerobic Respiration.
Ans: Aerobic respiration: Aerobic respiration is complete oxidation of glucose in the presence of oxygen.
Reaction:

$$C_6H_{12}+O_6+6O_2 \rightarrow 6CO_2+12H_2O+$$

39. Write names of main stages of Aerobic respiration.
Ans. Stages of Aerobic Respiration: Following are important stages of aerobic respiration.
i. Glycolysis ii. Krebs Cycle
iii. Electron Transport Chain

40. What is Significance of Anaerobic Respiration.
Ans. Anaerobic respiration is a source of energy for anaerobic organisms. Anaerobic respiration is a source of energy in aerobic organisms in case of deficiency of oxygen. Anaerobic respiration is a source of many products e.g. Ethyl Alcohal, cheese etc.

41. Define Anaerobic respiration.
OR Shortly explain Anaerobic Respiration.
Ans: Anaerobic respiration: The incomplete oxidation of glucose in the absence of oxygen, is called anaerobic respiration.

42. What is difference between aerobic and anaerobic respiration?
OR Differentiate between anaerobic and aerobic respiration.
Ans. Aerobic Respiration:
Aerobic respiration is complete oxidation of glucose in the presence of oxygen is called aerobic respiration.
Anaerobic Respiration:
Anaerobic respiration It is incomplete oxidation of glucose in the absence of oxygen, is called anaerobic respiration.

43. Name the final products of Aerobic and Anaerobic Respiration.
Ans. Anaerobic Respiration
Lactic acid or Ethyle Alcohol or carbondioxide are biproducts of anoevobic respiration.
Final Products:
Carbondioxide and water are

biproducts of aerobic respiration.

44. Define Fermentation Name its two types.

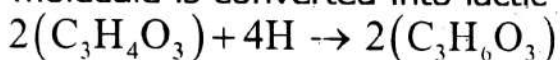
Ans. Fermentation: Breakdown of glucose in the absence of oxygen is called fermentation or anaerobic respiration. It yields very less energy.

Types of Fermentation:

(i) Alcoholic fermentation
(ii) Lactic acid fermentation

45. Describe Lactic Acid fermentation.

Ans. It occurs in skeletal muscles of humans and other animals during extreme physical activities. This also happens in the bacteria present in milk. In this type of anaerobic respiration, each pyruvic acid molecule is converted into lactic acid.

$$2(C_3H_4O_3)+4H \rightarrow 2(C_3H_6O_3)$$

46. Define alcoholic fermentation with equation.

OR What is Alcohlic Fermentation?

Ans. Alcoholic Fermentation: It occurs in bacteria and yeast, etc. In this type of anaerobic respiration, pyruvic acid is further broken down into alcohol (C_2H_5OH) and carbon dioxide.

Equation:

$$Pyruvic \longrightarrow Alcohol\ Ethyl + CO_2$$

47. Differentiate between Alcoholic fermentation and Lactic acid fermentation.

OR Define lactic acid fermentation.

Ans. The difference between Alcohlic fermentation and Lactic acid fermentation is given below.

Alcohlic Fermentation:

1) it occurs in bacteria, yeast etc.
2) In this process, pyruvic acid is further broken down into alcohol and CO_2.

Lactic acid Fermentation:

1) It occurs in skeletal muscles of humans and other animals during extreme physical activites.
2) In this process each pyruvic acid molecule is converted into lactic acid.

48. How is Soya Sauce made?

Ans. Soya Sauce is made by fermentation of Soya plant with the help of a fungus named Aspergillus.

49. Write the uses of Fermentation in yeast.

Ans. Fermentation in yeast is used in Beverages and Bakery industries.

50. What is meant by Anaerobes?

OR What are anaerobes? Write two examples.

Ans. Anaerobes: Some organisms get their energy from anaerobic respiration, instead of availability of free oxygen, such organisms are known as anaerobes.

Examples: Some organisms including bacteria and fungi get energy from anaerobic respiration and are examples of Anaerobes.

7.3.2 Mechanism of Respiration

51. What is glycolysis? Where it occurs?

OR Shortly explain glycolysis.

OR Define glycolysis.

Ans. Glycolysis occurs in cytoplasm and oxygen is not involved in this stage. That is why it occurs in both types of respiration i.e. aerobic and anearobic. In glycolysis, glucose (6C) molecule is broken into two molecules of pyruvic acid (3C).

52. What is Kreb Cycle?

OR Shortly explain Kreb Cycle.

Ans. In krebs cycle, the pyruvic acid molecules are completely oxidized along with the formation of ATP, NADH and $FADH_2$ Before entering in krebs cycle, pyruvic acid is changed into a -2 carbon compound called acetyl CoA.

53. What is meant by Electron Transport Chain?

OR What do you know about Electron Transport Chain?

Ans. Electron transport chain is the final step of cellular respiration. It is the

transfer of electron on an electron transport chain. In this step, NADH and $FADH_2$ release electron and hydrogen ions. These electrons are taken up by a series of electron carriers. When electrons move through the series of electron carriers they lose energy which is used to synthesize ATP. At the end of chain, electrons and hydrogen ions combine with molecular oxygen and form water.

7.3.3 The Energy Budget of Respiration

54. What is the energy budget of Respiration? Give example.

Ans. Each NADH produces 3 ATP in electron transport chain. The NADH generated in glycolysis gives 2 ATP because 1 ATP is spent to transport it across the mitochondrial memebrane.Each $FADH_2$ produces 2 ATP.

55. Difference between photosynthesis and respiration.

Ans. Difference between photosynthesis and respiration:

Characteristics	Photosynthesis	Respiration
Metabolism	Anabolism	Catabolism
Energy investment production	Investment of light energy to store it in the form of bond energy	Bond energy transformed into chemical energy of ATP
Organisms capable of;	Some bacteria, all algae all plants	All organisms
Site of occurrence	Chloroplasts	In cytoplasm and mitochondria
Time of occurrence	In daytime only, in the presence of light	All the time

Long Question (Unsloved)

7.1

1. Explain molecular structure of ATP
2. ATP is the energy currency of cell. Write shortly.

OR Interpret that ATP is the chief energy currency of all cells.

3. Describe the importance of Fermentation.

OR Define fermentation and explain its importance.

4. Briefly explain about Oxedation and Reduction reactions.
5. Define ATP. Discuss its composition by drawing its stucture.

7.2

6. What is photosynthesis? Write its balanced equation.

OR Describe the mechanism of photosynthesis.

OR Describe that water and carbon dioxide are raw material in photosynthesis.

OR Define photosynthesis, write its equation and describe the steps of dark reactions of photo synthesis

OR Describe the steps of light reaction of photosynthesis. Why is it called as Z-Scheme?

7. What do you mean by photosynthesis? Describe difference between photosynthesis and respiration.
8. What are light reactions and Dark reactions. Write the summary of the events of Dark reactions in Photosynthesis.

7.2.1

9. Explain all stages of Light Reaction in detail.

OR Explain the summary of light reaction and draw a diagram of Z-Scheme.

10. Explain dark reactions of photosynthesis.

OR Write a note on calvin cycle.

OR Describe Melvin Calvin's Cycle.

OR Who discovered the dark reactions? Write the summary of dark reactions of photosyntesis.

OR What is Photosystem? Explain the Calvin Cycle.

7.2.2

11. Describe the role of light and chlorophyll in plants.

OR What is the role chlorophyll and light in photosynthetic process? Explain.

12. Write a note on limiting factors of photosynthesis.

7.3 **7.3.1**

13. Differentiate between aerobic and anaerobic respiration.

OR What is meant by Aerobic and Anaerobic Respiration? Also describe the types of Anaeobic Respiration.

OR Define Respiration and explain different types of Anaerobic Respiration.

14. Define Anaerobic Respiration and explain its types.

OR Describe two types of Anaerobic Respiration.

15. Write importance of anaerobic respiration.

7.3.2

16. Write a note on electron transport chain.

OR Electron transport chainis a step of cellular respiration. Explain

17. Compare photosynthesis and respiration.

18. Describe the mechanism of respiration.

7.3.3

19. Write a note on energy budget of respiration.